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visual inspection or taking of photographs of the surface of the product to be examined from an upper side of the lighting unit through the center hole, and a plurality of transparent body surfaces each having a reflective layer so as to reflect and return light into the transparent body.

REMARKS

The Office Action of September 16, 1999, has been received and considered. Applicant appreciates the opportunity for his counsel to meet with Examiner Cariaso to discuss the instant application. Also, Applicant appreciates the indication that claims 2, 8, 10 and 12 include allowable subject matter and would be allowed if rewritten in independent form.

In the Office Action, claims 1, 4 and 6 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,325,231 to Tamura et al. Claim 5 was rejected under 35 U.S.C. §103 (a) as being unpatentable over Tamura in view of U.S. Patent No. 3,875,626 to Rosenberger et al.

Claim 1 has been amended as discussed during the interview of December 9, 1999. Currently, claims 1, 2, 4-6, 8, 10 and 12 are pending in the application. Reconsideration of the application as amended is respectfully requested.

The present invention relates to a lighting unit comprising a plurality of illuminants and a ring-shaped transparent body for light diffusion having a center hole open between its first and second ends, a light-emission surface and a light-introduction surface. The illuminants extend within the transparent body along the light-introduction surface for emitting light from the light-emission surface and for illuminating a surface of a product to be examined when the product is located at an under side of the lighting unit. The transparent body also includes transparent body surfaces which each have a reflective layer for reflecting and returning light into the transparent

body. The lighting unit enables both even surface emission of light and reduction of unevenness in light intensity on a surface of a product to be examined.

The lighting unit is suitable for examining the surface of a product by using reflected light. In accordance with the present invention, light emitted by the illuminants is projected into the transparent body, and reflected and scattered in a complex manner while being transmitted through the transparent body. This light is uniformly emitted from the light-emission surface at an even intensity to provide effective lighting to the product being examined. Since the transparent body is in the shape of ring having a center hole, actions such as visual inspection and the taking of photographs can be performed on a product to be examined through the open center hole. Also, the light-emission surface emits light that is more even in intensity than a light-emission surface having no center hole. Therefore, light intensity on a surface of a product to be examined is constant and even; the illuminants are not reflected on the surface of the product; and the occurrence of failure when detecting a micro flaw or a finishing defect on the surface of the product is reduced.

Claims 1, 4 and 6 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,325,231 to Tamura et al. Tamura discloses a microscope illuminating apparatus including a plurality of light sources positioned so as to form an illumination optical path for providing light to a specimen. The Office Action relies on the embodiments disclosed in Figs. 4 and 9. However, during the interview, the Examiner explained that Fig. 4 was relied upon to disclose a plurality of illuminants arranged in a circular pattern. The Examiner also explained that Fig. 9 was relied upon to disclose the remaining elements recited in the rejected claims. Applicant submits that the embodiments of Tamura fail to disclose the present invention, either individually or collectively.

The embodiment in Fig. 4 discloses a revolver 21 with an annular illuminating section 40 with point light sources 41 positioned above a first end of an illumination optical path formed by an outer frame 37 and a light-shielding tube 33a. A transparent lens 29 which includes a center hole is positioned at a second end of the illumination optical path proximate the lower ends of the outer frame 37 and the light-shielding tube 33a. This embodiment clearly does not disclose a lighting unit as claimed with a ring-shaped transparent body having light-introduction and light-emission surfaces with a plurality of illuminants extending within the transparent body along the light-introduction surface. Additionally, this embodiment also fails to disclose such a transparent body with a plurality of transparent body surfaces, each having a reflective layer. Tamura does not disclose reflective surfaces on lens 29. Therefore, the embodiment of Fig. 4 does not anticipate claim 1 for it does not disclose each and every element recited in claim 1.

The embodiment disclosed in Fig. 9 of Tamura also fails to disclose the claimed lighting unit. This embodiment is used to perform either bright field or dark field illumination. When dark field illumination is performed, a single light source 66, which is spaced from any ring shaped transparent body having a center hole, delivers light to an optical fiber bundle 84. An end 84b of each light carrying optical fiber is annularly disposed in an annular condenser case 86. The light exiting the ends 84b of these fibers is collimated to an annular parallel beam by a collimator lens 87 and radiated on the dark field condenser lens 89. The dark field condenser lens 89 includes first and second reflecting surfaces which focus the light onto the specimen 62.

The condenser lens 89 has been relied upon to disclose the transparent body recited in claim 1. However, Tamura does not disclose illuminants which extend within condenser lens 89. Instead, the illuminants - the ends of the optic fibers 84b - are separated from the condenser lens by the

collimator lens 87. As a result, these illuminants cannot extend within the dark field condenser lens 89. Moreover, the condenser lens 89 does not include a center hole that is open. Instead, the center hole of this lens is closed by another condenser lens 88. For at least the above discussed reasons, the embodiment of Fig. 9 does not disclose each and every element of the claimed lighting unit and thus cannot anticipate claim 1. Since the embodiments disclosed in Tamura fail to disclose the lighting unit recited in claim 1, either individually or in combination with each other, it is requested that the rejection of claims 1, 4 and 6 be withdrawn.

Claim 5 has been rejected under 35 U.S.C. §103 (a) as being unpatentable over Tamura in view of U.S. Patent No. 3,875,626 to Rosenberger et al. Rosenberger also discloses a microscope illumination apparatus. This reference is relied upon for disclosing an annular transparent body 17 having a concave face and a hollow truncated cone shape. However, like Tamura, Rosenberger fails to disclose a lighting unit as recited in claim 1 with a plurality of illuminants extending within the transparent body. Therefore, even if motivation existed for the modification suggested in the Office Action, the resulting combination would not arrive at the claimed invention for Rosenberger does not teach what Tamura lacks. Therefore, the rejection should be withdrawn.

Conclusion

For the reasons discussed above, Applicant submits that claims 1, 2, 4-6, 8, 10 and 12 are in condition for allowance. A notice to this effect is earnestly solicited. Additionally, it is requested that the amendments to claim 1 be entered for they place the application in better form for appeal and do not require further consideration by the Examiner. If the examiner has any questions, it is requested that he phone the undersigned at (202) 508-9248. No fees are believed needed.

However, in the event that any fees for filing this amendment are required, please charge them to
Deposit Account No. 19-0733.

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